

LLNL Environmental Restoration Division (ERD)  
Standard Operating Procedure (SOP)

**ERD SOP 2.7: Pre-sample Purging and Sampling of Low-Yielding Monitor Wells—Revision: 5**



**AUTHOR(S):**  
R. Goodrich and G. Howard

**APPROVALS:** **Date**

Albert L. Lamare 9/5/03  
Division Leader

[Signature] 9/03/03  
Environmental Chemistry  
and Biology Group Leader

**CONCURRENCE:** **Date**

Rebecca Goodrich 8/28/03  
QA Implementation  
Coordinator (Acting)

### 1.0 PURPOSE

The purpose of this SOP is to provide well purging (evacuation) and sampling techniques that will obtain representative samples from wells that yield less than three well-casing volumes of water.

### 2.0 APPLICABILITY

This SOP applies to sampling ground water monitor wells that are completed in low-yielding aquifers, which produce less than three well casing volumes prior to sampling.

### 3.0 REFERENCES

- 3.1 Barcelona, M. J., J. P. Gibb, J. A. Helfrich, and E. E. Garske (1985), *Practical Guide to Ground Water Sampling*, U.S. EPA, Washington, D.C. (EPA-600/2-85/104).

Procedure No. ERD SOP-2.7	Revision Number 5	Page 2 of 6
------------------------------	----------------------	-------------

- 3.2 U.S. EPA (1986), *RCRA Ground Water Monitoring Technical Enforcement Guidance Document*, Washington, D.C. (OSWER-9950.1).
- 3.3 P. M. Kearl, N. E. Korte, M. Stites and J. Baker (Fall 1994), *GWMR, Field Comparisons of Micropurging vs. Traditional Ground Water Sampling*.
- 3.4 G. W. Howard, G. Kumamoto (1994), *Cost Effectiveness and Waste Minimization through Low Volume, Pre-Sample Purging Using Historic Sustainable Yield, While Utilizing Existing Sampling Equipment.*, TIE Conference.
- 3.5 U.S. EPA (1992), *RCRA Ground-Water Monitoring: Draft Technical Guidance*, Washington, D.C. (EPA/530-R-93-001).

## **4.0 DEFINITIONS**

See SOP Glossary.

## **5.0 RESPONSIBILITIES**

### **5.1 Division Leader**

The Division Leader's responsibility is to ensure that all activities performed by ERD at the Livermore Site and Site 300 are performed safely and comply with all pertinent regulations and procedures, and provide the necessary equipment and resources to accomplish the tasks described in this procedure.

### **5.2 Field Personnel**

The field personnel's responsibility is to ensure safe completion of evacuating and sampling ground water monitor wells according to guidelines set forth by this procedure, as well as other associated SOPs. The wells to be purged frequently are declared in the quarterly Sampling Plan provided by the Sampling Coordinator (SC).

### **5.3 Field Support Personnel**

The field support personnel's responsibility is to provide the appropriate equipment, collection devices for purge water, and general field support, which enables personnel to perform field activities efficiently and on time.

### **5.4 Sampling Coordinator (SC)**

The SC's responsibilities include providing the following: A quarterly Sampling Plan, a specific sample plan for each day (Daily Operations Guide [DOG]), all necessary technical information required for purging wells, and electronically generated Ground Water Sampling Data Sheets (SOP 2.1, "Presample Purging of Wells," Attachment C).

### **5.5 Subproject Leader (SL)**

The SL is responsible for the overall investigation, planning, assessment, and remediation within a study or treatment facility area.

Procedure No. ERD SOP-2.7	Revision Number 5	Page 3 of 6
------------------------------	----------------------	-------------

## 6.0 PROCEDURES

This SOP describes procedures to minimize problems inherent in sampling low-yielding wells, and it provides consistency in sampling such wells. Low-yielding wells are typically sampled using grab sampling, 90% of 1 casing volume, or dry-out method. Pre-sample purging and sampling should be performed without lowering the water level in the well below the screened interval, to prevent water from cascading down the screen, possibly volatilizing constituents of interest. However, the sustainable flow rate of some wells at Site 300 and the Livermore Site is low ( $<0.5$  gpm), making it impossible to avoid drawing the water level into the screened interval and/or drying out the well.

### 6.1 Preparation

- 6.1.1 Prior to commencement of field activities, perform preparation activities described in SOP 4.1, "General Instructions for Field Personnel." Personnel shall meet all training requirements, review the appropriate Site Safety Plan (SSP), and all applicable SOPs, Operational Safety Procedures (OSPs), and Integration Work Sheets (IWSs) prior to performing work. Current copies of all relevant documents shall be retained by the field personnel.
- 6.1.2 Review all pertinent sampling information, such as the quarterly Sampling Plan, Well Specification Table, Technical Information Spreadsheet, and electronically generated Ground Water Sampling Data Sheets (if applicable) provided by the SC. The plan contains the following information:
  - Locations to be sampled.
  - Proposed sampling methods (See SOP 2.1, Attachment B, Methodology Sampling Codes).
  - Requested analyses.
  - Contract analytical laboratory (CAL) to which samples are to be sent for analyses.
  - Estimated amount of purge water to be collected.
  - Current technical information for each well.
- 6.1.3 Obtain appropriate data collection forms i.e., Chain-of-Custody (CoC) forms, Ground Water Sampling Data Sheets (SOP 2.1, Attachment C), assigned Document Control Logbook, labels, and any necessary shipping forms. Instructions for completing the logbook entries and field forms are provided in SOP 4.2, "Sample Control and Documentation. Consult with the SC for the appropriate pre-sample purging method to apply to the site if it is not indicated on the sampling plan.
- 6.1.4 Contaminant information is provided in the quarterly Sampling Plan or by the SC and should be reviewed prior to sampling. At Livermore Site, the SC checks the most recent analytical results prior to providing guidance to sampling personnel as part of the DOG (SOP 2.1, Attachment A). The SC will also provide contaminant information for newly completed installations that may not appear on the plan.
- 6.1.5 Obtain appropriate materials to conduct field work according to SOP 2.1, Attachment D, Equipment Checklist.



Procedure No. ERD SOP-2.7	Revision Number 5	Page 4 of 6
------------------------------	----------------------	-------------

6.1.6 The number and type of sample containers needed for the sampling event should be obtained from the sample bottle inventory. The appropriate personnel should keep a sufficient stock of sample containers on hand. Field personnel should also maintain an inventory of supplies (i.e., disposable 0.45µ fiber filters, trip blanks, field blank water (ordered from the CAL), plastic bags, etc.), to ensure adequate sampling supplies are available at all times.

6.1.7 Organize sampling route:

A. Site 300

1. Complete an entire study area before beginning the next, when possible.
2. Proceed to sample wells, working from the least contaminated to the most, when possible.

B. Livermore Site

The Livermore Site SC may specify the order of well sampling. Livermore Site contains overlapping study areas which are not hydrogeologically isolated. When working with portable equipment, sample wells from the least to the greatest contaminant levels, as directed, by the SC.

6.1.8 The Administrative Escort Services must be given a 24-hour notice (at a minimum) before work is scheduled in restricted areas.

6.1.9 Enter the required information on the Ground Water Sampling Data Sheets and Document Control Logbook per the instructions in SOP 4.2, "Sample Control and Documentation." When using the electronically generated Ground Water Sampling Data Sheets all the initial information is already provided and should be checked.

## 6.2 Purge Water Collection

6.2.1 At Site 300, the field support personnel must ensure that wells have sufficient collection drums available at the well head for purge water containment (SOP 4.7B, "Site 300 Treatment and Disposal of Well Development and Well Purge Fluids"). The quantity of purge water to be collected for each well is listed in the quarterly Sampling Plan or calculated by the SC for newly installed monitor wells.

6.2.2 The Livermore Site field personnel will tow a collection tanker with the sampling vehicle and when necessary, the SC may provide a specific order of wells to be sampled. Tankers and drums filled with purge water may not be left at the well location and will be logged and disposed of daily, when possible according to SOP 4.7A, "Livermore Site Treatment and Disposal of Well Development and Well Purge Fluids."

## 6.3 Operation

6.3.1 Site-Specific Purging Techniques:

A. Site 300

1. Begin purging the well using the appropriate technique as described in SOP 2.1.
2. Initial field measurements should be taken from the first available water as soon as purging begins. Field parameter measurements consist of



Procedure No. ERD SOP-2.7	Revision Number 5	Page 5 of 6
------------------------------	----------------------	-------------

temperature, pH, and specific conductance as described in SOP 2.2, “Field Measurements on Surface and Ground Waters.” Once the initial field parameters have been measured a discharge rate should be calculated. According to the manufacturer’s recommendation, the well should be purged at a discharge rate of no less than 1.2 gpm when using an electric submersible pump. Regardless of the type of purging device used, the intent is to cause the least disturbance possible to the aquifer during the purging process.

3. Additional field parameter measurements should be collected as described in SOP 2.1.
4. Purging a well to dryness is acceptable when specified by the SC or SL. Follow procedures below beginning with Section 6.3.2.

#### B. Livermore Site

1. One method of sampling wells that fit the “low-yielding monitor well” criteria is to purge a minimal amount of water prior to sampling using low-volume purge techniques. When specified by the SL, specific Depth-grab Sampling will be used.
  2. The SC will instruct the sampler as to the preferred sampling method in the DOG. The method chosen for sampling each well will be determined by the SC after an interpretation of technical data and in consultation with SL or other appropriate personnel.
  3. Exposing the screened interval and/or the pump intake is to be avoided. The pump intake placement should be mid-screened interval, unless otherwise requested by the SL or SC.
  4. The pumps discharge rate should be reduced to permit the recording of as many parameter measurements as possible, prior to sampling. The use of a flow cell allows continuous measurements to be made.
  5. Alert the SC if the pumps discharge rate is not easily reduced to allow sampling prior to the well drying out, a pump change will be requested.
- 6.3.2 If a well is purged to dryness, determine the amount of water purged from the well after discharge from the pump has ceased. This volume of water is recorded on the Ground Water Sampling Data Sheets, SOP 2.1, Attachment C.
- 6.3.3 Once the well has been purged dry, well recovery should be monitored by measuring the water level and calculating the volume of water remaining in the well casing. In order to sample the well, a sufficient amount of water must be available to purge the pump and discharge lines. This amount will vary depending upon pump type, well depth, and number and types of samples required. When a well goes dry prior to sample collection, field parameters should be measured before collecting the sample.
- 6.3.4 Sampling procedures in SOPs 2.2 through 2.6 should be followed as closely as possible. Ideally, all samples for the analysis of volatile compounds should be obtained within 24 hours of purging the well dry. It is acceptable to obtain these samples within 24 hours, allowing additional well recovery for any remaining samples for nonvolatile analysis. If sampling is split between recovery periods, field measurements should be obtained after each recovery period.
- 6.3.5 If insufficient water is available to obtain the samples for volatile analysis, the well should be monitored approximately every 24 hours until sufficient water is

Procedure No. ERD SOP-2.7	Revision Number 5	Page 6 of 6
------------------------------	----------------------	-------------

available for sampling. If sufficient water is still not available for sampling at the end of the work day, samples should be obtained immediately the next morning, providing water is available. If there is still insufficient water available for sampling, the 2-hour monitoring schedule should be resumed until enough water is available for sampling.

- 6.3.6 All purging rates, number of times purged, field measurements, and well recovery monitoring should be recorded on the Ground Water Sampling Data Sheets.

#### **6.4 Post Operation**

- 6.4.1 Perform post operation activities per SOP 4.1.
- 6.4.2 Complete and deliver documentation as described in all water sampling procedures SOPs 2.1 through 2.6.

### **7.0 QA RECORDS**

- 7.1 Ground Water Sampling Data Sheets
- 7.2 Document Control Logbooks
- 7.3 Chain-of-Custody Forms

### **8.0 ATTACHMENTS**

Not applicable.